B-2—SENSITIVITY ANALYSIS FOR MODEL SIMULATING THE MAIN NAVAJO AND KAYENTA AQUIFERS

The baseline model for the main part of the Navajo and Kayenta aquifers was tested to determine sensitivity of simulation results to variation in properties and fluxes within what is considered a reasonable range. The parameters varied were (1) hydraulic-conductivity values for each of the simulated aquifers (the basin fill, the alluvial fan, and the Pine Valley monzonite); (2) the vertical leakance between the two aquifers; (3) the streambed conductance of river cells; (4) the conductance of general-head boundaries representing subsurface inflow; (5) the drain conductance of springs, as well as drains simulating seepage to underlying formations; and (6) the amount of areal recharge.

The graphs indicate how much simulation results changed from the baseline simulation. How baseline water levels in each layer and head-dependent fluxes responded to variations over two orders of magnitude in hydraulic conductivity of both model layers are shown in figures B-2 through 4. Variations in hydraulic conductivity of the Navajo aquifer affected calculated water levels more substantially (as much as ± 300 ft) than variations in hydraulic conductivity of the Kayenta aquifer (+100 to -250 ft). The same variations in hydraulic conductivity in each layer moderately affected net general-head boundary recharge (subsurface inflow) and discharge to rivers. Other recharge and discharge fluxes were affected minimally. Water levels and fluxes in the baseline model were insensitive to variations in the vertical leakance between the Navajo and Kayenta aquifers (figs. B2-5, B2-6).

Simulated water levels and seepage fluxes from and to rivers were very sensitive to variations over two orders of magnitude in riverbed conductance (figs. B2-7, B2-8). However, simulated spring discharge and net general-head boundary-recharge (subsurface inflow) fluxes were less sensitive to these variations because these recharge and discharge components are not located along the river corridors. Simulated water levels and fluxes were largely insensitive to variations overfour4 orders of magnitude in general-head boundary conductance (subsurface inflow). However, recharge at general-head boundary cells was quite sensitive to these variations (figs. B2-9, B2-10). Simulated water levels and fluxes were not sensitive to variations over four orders of magnitude in drain conductance, including spring discharge, which would be directly affected by this parameter (figs. B2-11, B2-12). This may indicate that even at one-hundredth of the baseline simulation, these conductance values are still too high to impede this source of discharge.

Simulated water levels were very sensitive to variations in areal recharge. Variations in recharge by a factor of 2 caused average water-level changes of more than 160 ft in both model layers (fig. B2-13). This increase in areal recharge produced large increases in discharge to rivers, spring discharge, and general-head boundary recharge, whereas recharge from rivers was largely unaffected (fig. B2-14).

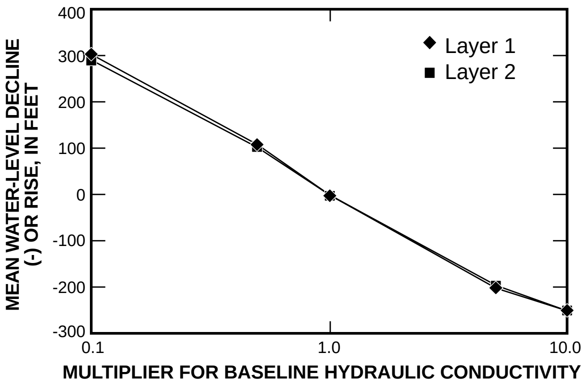

Figure B2-1. Sensitivity of water level to variations in horizontal hydraulic conductivity of the Navajo aquifer in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

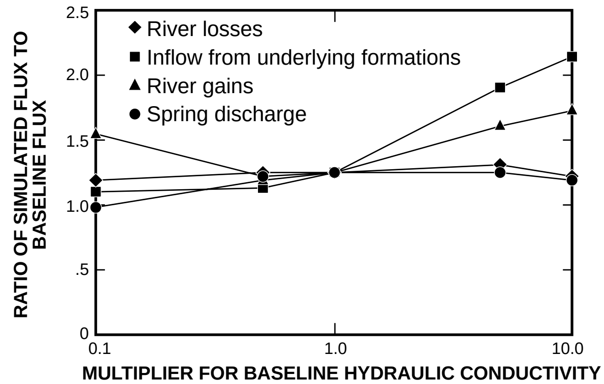

Figure B2-2. Sensitivity of simulated flux to variations in horizontal hydraulic conductivity of the Navajo aquifer in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

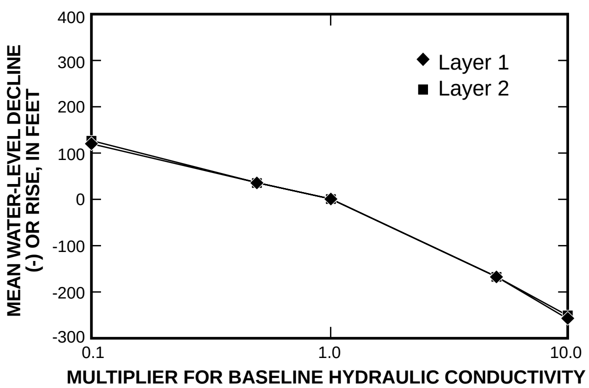

Figure B2-3. Sensitivity of water level to variations in horizontal hydraulic conductivity of the Kayenta aquifer in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

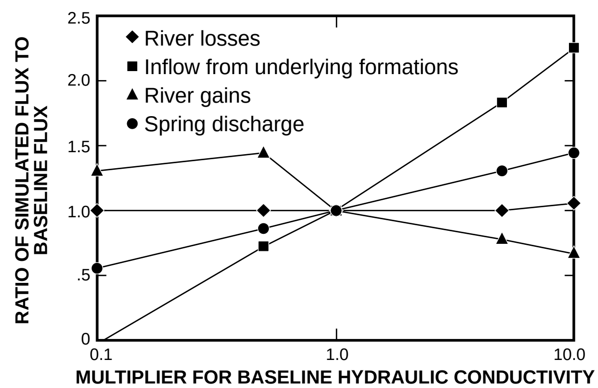

Figure B2-4. Sensitivity of simulated flux to variations in horizontal hydraulic conductivity of the Kayenta aquifer in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah

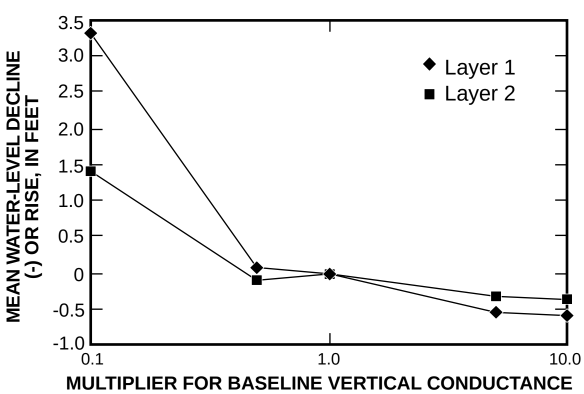

Figure B2-5. Sensitivity of water level to variations in vertical conductance between the Navajo and Kayenta aquifers in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah

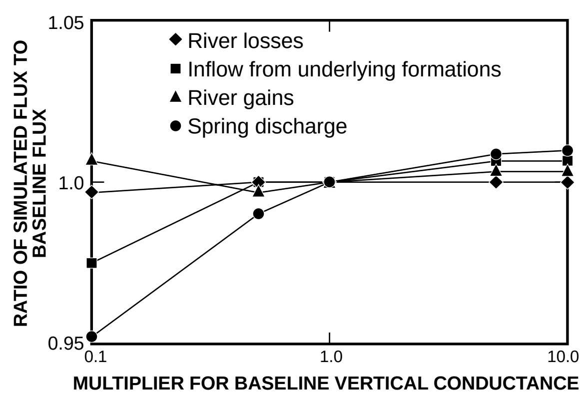

Figure B2-6. Sensitivity of simulated flux to variations in vertical conductance between the Navajo and Kayenta aquifers in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

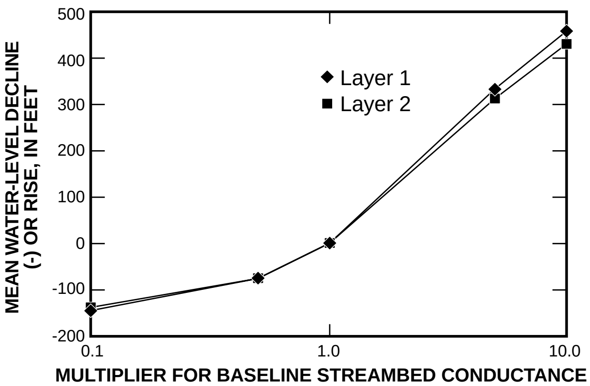

Figure B2-7. Sensitivity of water level to variations in streambed conductance in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

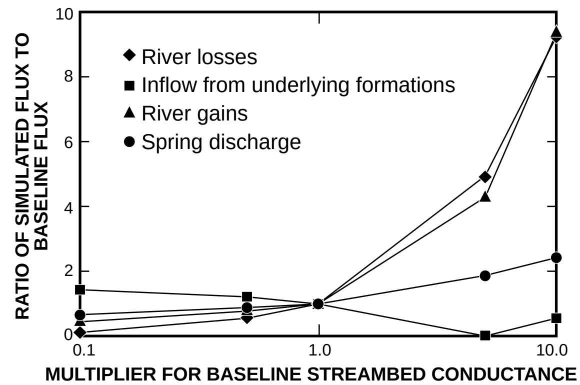

Figure B2-8. Sensitivity of simulated flux to variations in streambed conductance in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

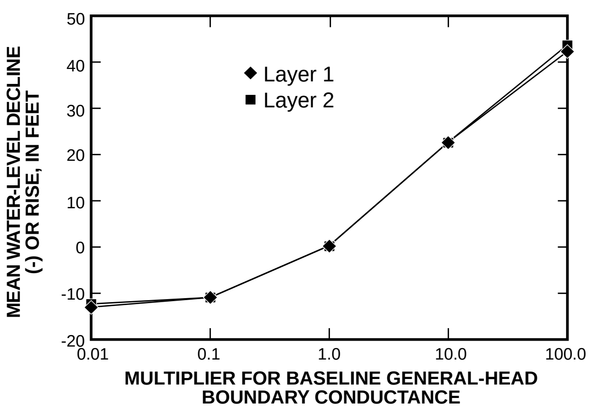

Figure B2-9. Sensitivity of water level to variations in general-head boundary conductance, representing inflow from underlying formations, in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

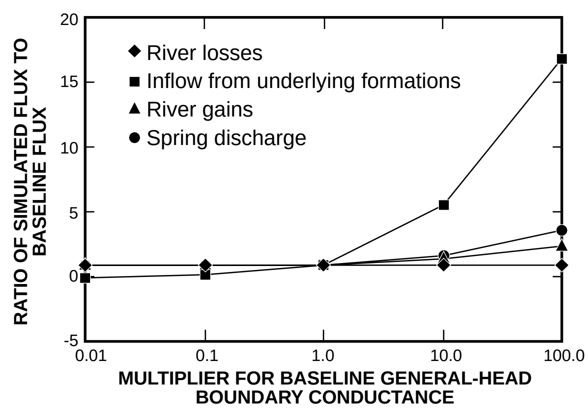

Figure B2-10. Sensitivity of simulated flux to variations in general-head boundary conductance, representing inflow from underlying formations, in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

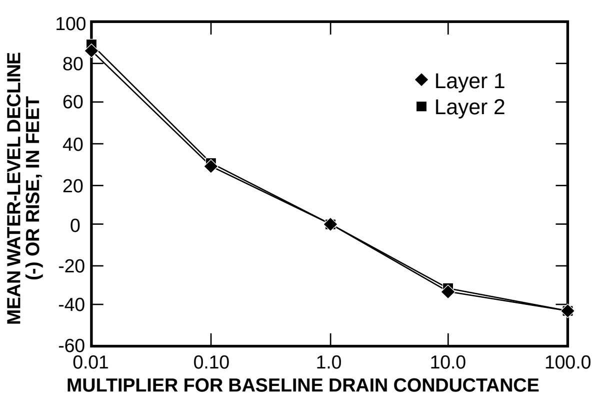

Figure B2-11. Sensitivity of water level to variations in drain conductance, representing spring discharge, in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

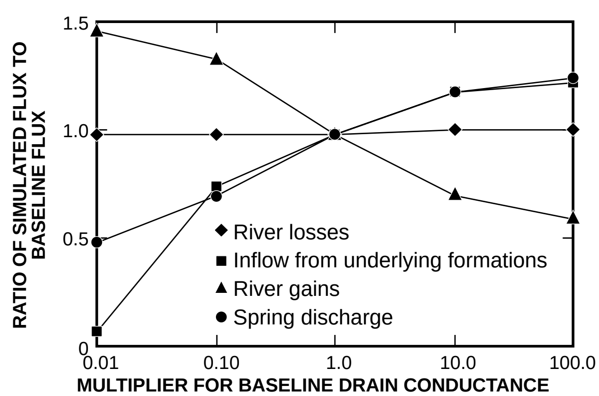

Figure B2-12. Sensitivity of water-budget flux to variations in drain conductance, representing spring discharge, in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

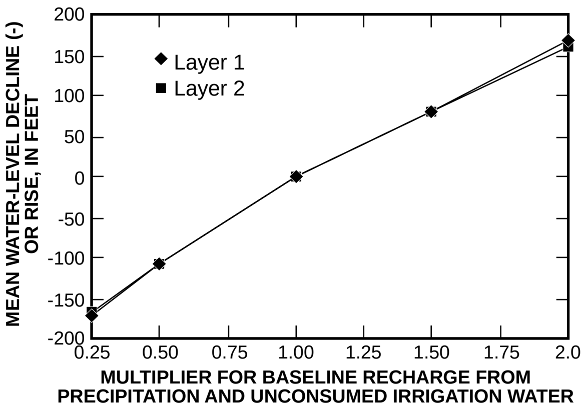

Figure B2-13. Sensitivity of water level to variations in recharge from precipitation and unconsumed irrigation water in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.

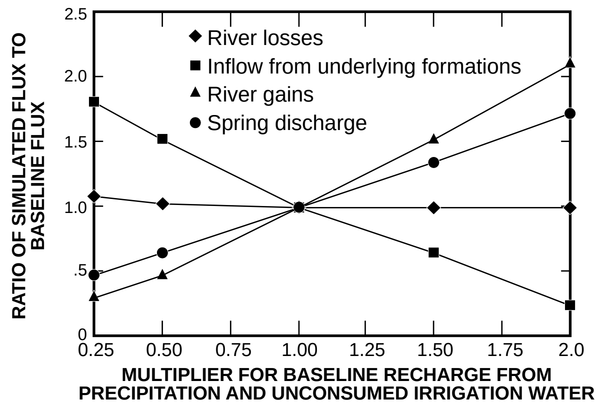

Figure B2-14. Sensitivity of simulated flux to variations in recharge from precipitation and unconsumed irrigation water in the ground-water flow model of the main part of the Navajo and Kayenta aquifers within the central Virgin River basin study area, Utah.